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THE MIAMI CONSERVANCY BULLETIN

DECEMBER 1919

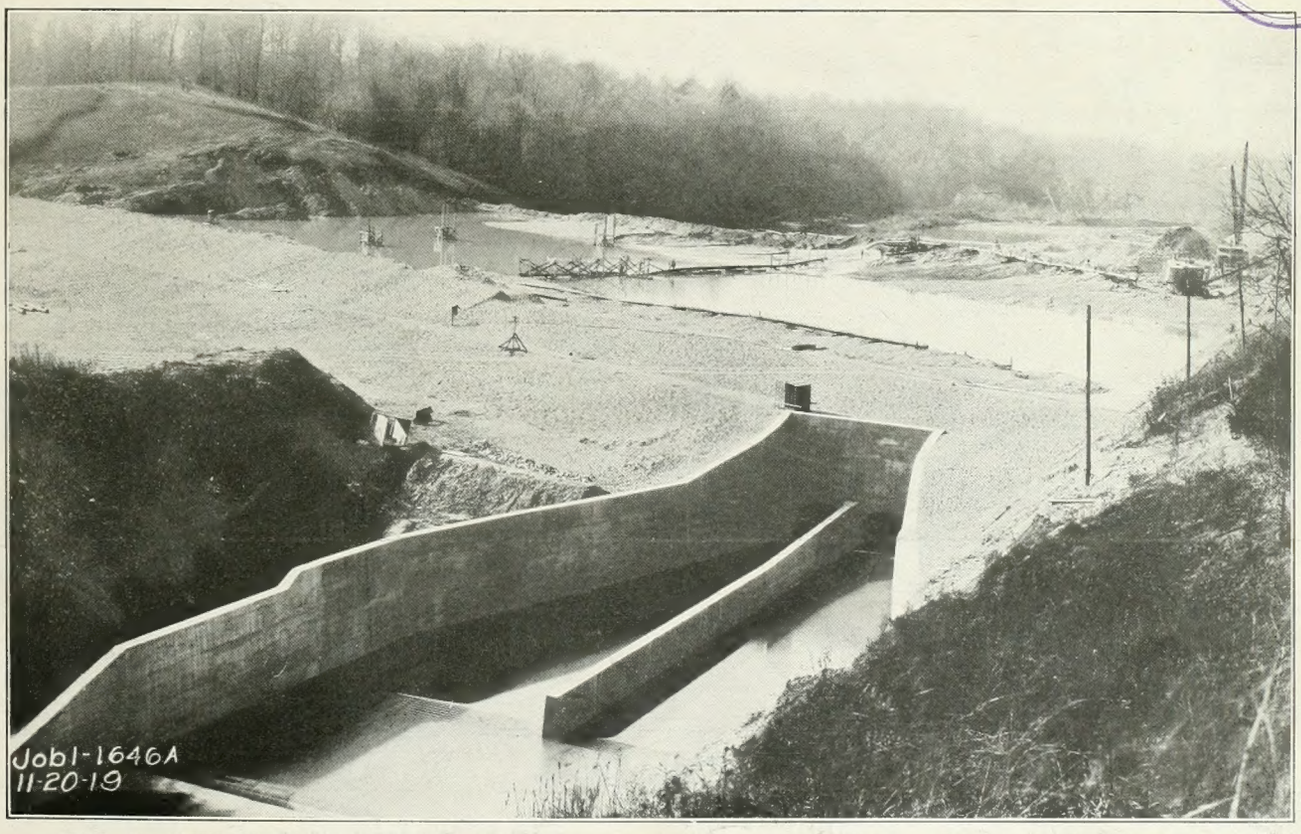

FIG. 54—OUTLET AND HYDRAULIC FILL AT THE GERMANTOWN DAM NOVEMBER 20, 1919

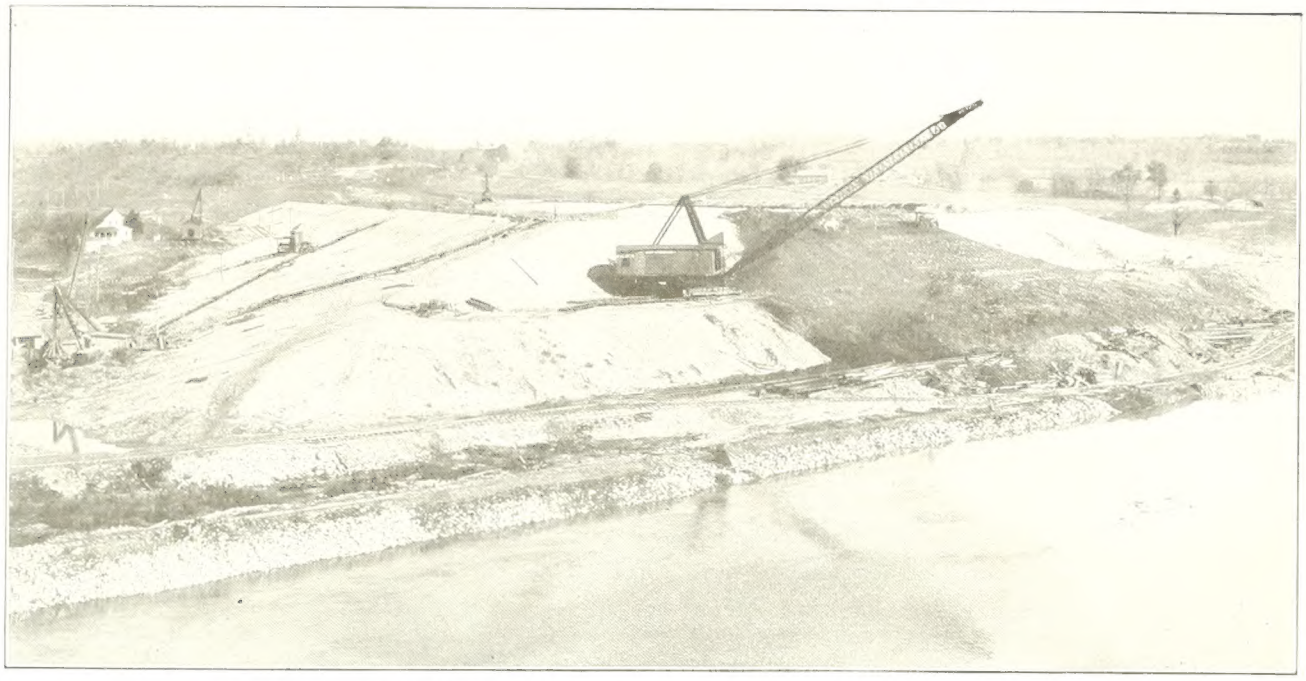

FIG. 55—BUILDING FIRST SECTION, ENGLEWOOD DAM, NOV. 11, 1919

This section is east of the river, the old channel of which is now occupied by the dead water in the foreground, the river itself flowing through the finished conduits, which are out of the picture, to the right. The top of the upstream slope (at the left) is about 57 feet above the base, the average elevation of the section about 50 feet. It will be carried about 10 feet higher and then left temporarily till the other sections are brought up correspondingly. The final height will be about 56 feet higher than the top as it is in the picture.

The material is of earth, excavated in the valley bottom above, mixed with water and pumped to a pool on the top of the embankment through the two lines of pipe seen climbing the slope.

FIG. 56—SEWER EQUIPMENT ON BUCKEYE STREET, HAMILTON

A view of the equipment used in building the Hamilton storm sewers, consisting of a ½-yard Smith concrete mixer, portable electric derrick with ¾-yard clamshell bucket, a 3-ton Plymouth gasoline locomotive and four 1½-yard side dump cars. This picture was taken on Buckeye Street near Third. Taken Nov. 20, 1919.

THE

MIAMI CONSERVANCY BULLETIN

PUBLISHED BY THE MIAMI CONSERVANCY DISTRICT

DAYTON, OHIO

Volume 2 December 1919 Number 5

Index

Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to Office Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to G. L. Teeple, Miami Conservancy District, Dayton, Ohio.

Annual Report of the Board of Directors

The Second Annual Report of the Board of Directors of the Miami Conservancy District, giving an account of activities for the period from October 1, 1918, to September 30, 1919, is about to be filed in the Court of Common Pleas of Montgomery County. It consists of 34 pages of text followed by a full statement of receipts and expenditures for the year ending July 31, 1919.

In the first ten pages is given a brief review of the principal phases of the District's affairs, such as the cost of executing the Official Plan, the labor situation, bond sales, tax collections, disposal of lands owned by the District, audits of accounts, and the more important litigations pending.

Twenty-four pages are devoted to matters pertaining to engineering and construction, a separate report of progress being given for each major division of the work.

Generally speaking the Miami Conservancy District has passed through a favorable year for its construction activities. The mild winter of 1918-1919 proved of great advantage and made it possible to advance by several months the progress on some sections of the work, over what had been anticipated. As a result a material degree of protection against floods has already been provided. The high water of March, 1919, did not injure either the uncompleted parts of the work nor the equipment used in its construction, but caused progress to be delayed for a short time.

The labor situation has been satisfactory; the men seem especially well satisfied with living conditions at the construction camps, the general record of health and accidents has been very favorable, and the labor turnover has been much smaller than on similar work elsewhere.

The year 1919 was marked by the completion of the outlet structures at four of the dams, and by the finishing of the new railroad locations. Work on the dams themselves has progressed satisfactorily. It has also been carried on at all other localities required in the Official Plan, with the exception of Tippecanoe City, Troy and Piqua.

A New Book by Professor Mead

Every work written by Professor Daniel W. Mead of Madison, Wisconsin, consulting engineer of the District, is sure to be interesting to engineers; but his latest book, entitled "Hydrology," is of particular value to the engineering staff of the District on account of its intimate connection with the problems encountered in the evolution of the local flood protection plans.

This volume of over 600 pages is a most complete, satisfactory, and authoritative treatment discussing every engineering aspect of the origin, occurrence, and distribution of rainfall, with considerable account of the control, utilization, and ultimate disposition of the waters resulting from rainfall after they reach the earth's surface.

The general fundamental laws relating to hydrologic phenomena are stated and discussed in a manner applicable to all parts of the earth, but the detailed applications are restricted chiefly to this country. The book is a treasure mine of useful ob-

servational data collected throughout the United States, and far surpasses in this respect any similar book hitherto available.

After discussing general atmospheric conditions, winds, and storms, the measurement of rainfall is taken up, followed by a long description of the variations in rainfall throughout the United States, and of the causes and nature of these variations.

The last third of the book considers stream flow, the conditions determining the amount of run-off and its variations, and concludes with a discussion of floods. There are many references in the book to the studies made by the engineers of the Miami Conservancy District, and frequently the data obtained by the District is quoted.

Many of the subjects touched upon could not be exhaustively treated in a single volume of this kind, but to each chapter is appended a carefully selected list of references to specialized literature on the topic under discussion, forming a most valuable feature of the work. The volume contains a useful index.

Professor Mead is a leading and eminent tuthority in this country on the subject of this volume, and has produced a work which is a most valuable addition to the engineering literature of the subject, a work which no engineer engaged in this field can afford to be without.

S. M. Woodward.

Charles H. Locher in the American Magazine

An interesting article in the December number of the American Magazine is devoted to an appreciation of the life work of Charles H. Locher, Superintendent of Construction for the District. It has been the observation of the Bulletin Editor that much of this sort of thing contains very considerable percentages of bunk and he is therefore pleased to be able to recommend the present article to Bulletin readers as being singularly free from that ingredient. It is a sketch of Mr. Locher done largely in words from his own lips. Those who know the man can hear the intonations of his voice as they read, so true is the impression which the article conveys. The writer, "Allison Gray," probably a pen name, clearly knows her business. Mr. Locher is a modest man and an interview with him concerning the work of his life is not easy to secure. He did his best to squirm from under, but "Allison Gray" pinned him firmly and he was obliged to deliver the goods. What he gave, the writer had the skill and the discernment to give as he gave it, although no doubt with some rearrangement, such as the necessities of an article of the kind required. The result is an uncommonly truthful picture. If anybody, friend or enemy, wants to know what kind of man is directing the construction work of the Miami Conservancy District, he can easily find out. Read that article.

Farm Circular No. 4 Issued

Farm Circular No. 4, of the series issued by the Land Division of the District, is now off the press. Its purpose is to furnish prospective purchasers a clear guide to the use of the leaflets describing the individual farms, so that they will know what the probable conditions will be during floods on any farm in any retarding basin, especially as to the elevations of the buildings and whether it will be necessary to move these to comply with the rules for safety established by the District.

These leaflets are being issued in numbered series as needed, one to each farm as it comes up for sale. Each leaflet gives the location, nature of soil, etc., and also the elevations of the buildings and of the bottom and uplands. Farm Circular No. 4 gives the elevations which would have been reached by every notable flood between 1893 and 1919 in each retarding basin, supposing the dams in existence; also the spillway levels. Used with the leaflets it is thus a complete guide to flood conditions for every farm in the Conservancy District. The rules of the District require the buildings to be moved to higher ground if they are more than 10 feet below spillway level for the basin in which they lie. A removed building is not allowed to be rebuilt more than 5 feet below spillway level. (Some exceptions are made to these rules where the lay of the land is especially favorable for safety to the residents during floods.)

Copies of the new circular can be obtained free by addressing the Miami Conservancy District, Farm Division, Dayton, Ohio.

Coal and Copper

Apropos of the coal famine, friends of the Conservancy may be glad to know that sufficient coal for the needs of the District through the coming winter was bought last May at the low figure of $1.84 per ton f. o. b. mines. It was secured in West Virginia, the quantity being 27,000 tons. The price of the same coal, before the present flurry, was $3.50 per ton for this grade of coal. Saving $44,800.00.

Another item of interest is the purchase of copper for overhead and trolley wire construction for the Ohio Electric Railway. This material, amounting to over 100,000 pounds, has not yet been put into the line. It was bought, however, last April, when the price was at or near the bottom of the notch. The advance since then has been about 58 per cent, representing a saving on this item of over $10,000.

These figures are given, not as exceptional, but to show that the Purchasing Division under the leadership of Fowler S. Smith, is also "onto its job" and holding up its end.

Influenza and the Conservancy Medical Service

The coming of the winter, and the sporadic recurrence of the epidemic in various quarters, has called attention once more to the influenza. Dr. W. M. Smalley, the Conservancy physician, reports that there have been so far this season among the workers of the District about a dozen cases of the disease. These have all been light, and easily taken care of. He considers that while reasonable precautions are naturally advisable, there is no need for alarm. Theories of the disease have been pretty much exploded and there is yet no known specific. The disease is contagious and probably microbic, but the microbe has never been isolated, nor a "serum" or "culture" giving immunity discovered. The best preventives are the simplest—sunlight, fresh air and plenty of them. Don't be afraid of having a window open. Sleep always with a window open. Don't be afraid of fading rugs or cur-

(Continued on page 79.)

Building the Hamilton Storm Sewers

Three Concrete Sewers, 4′ to 5′ 8″ in Size, and Totaling 4160′ in Length, Have Been Built.

By R. B. McWhorter, Assistant Division Engineer

Three storm sewers have been built as a part of the local flood protection work at Hamilton. The largest of these is located on Buckeye Street, and extends from the tail-race, between Fourth and Fifth Streets, to the river; another is located on Wood Street and extends from Second Street to the river, and the third one is located on Front Street, running southerly from the old Crawford's Run channel to South Avenue, thence westerly to the river. The map of Hamilton, on page 27 of the September, 1919, issue of the Bulletin, shows the location of these sewers.

The Buckeye Street Sewer

There is an area in the northeast part of the city from which the storm sewers drain into the tail-race, which until recently, flowed northerly to Old River. This tail-race was a part of the Hamilton and Rossville hydraulic and was abandoned for power use with the other parts inside the corporation limits. Its outlet was closed by the Old River improvement, and the sewers that empty into it are now served by the Buckeye Street intercepting sewer, which connects with the tail-race. The maximum flood stage to be expected at Buckeye Street is elevation 589.5 feet, or about 3.5 feet lower than at the tail-race outlet, a noteworthy advantage of the new location.

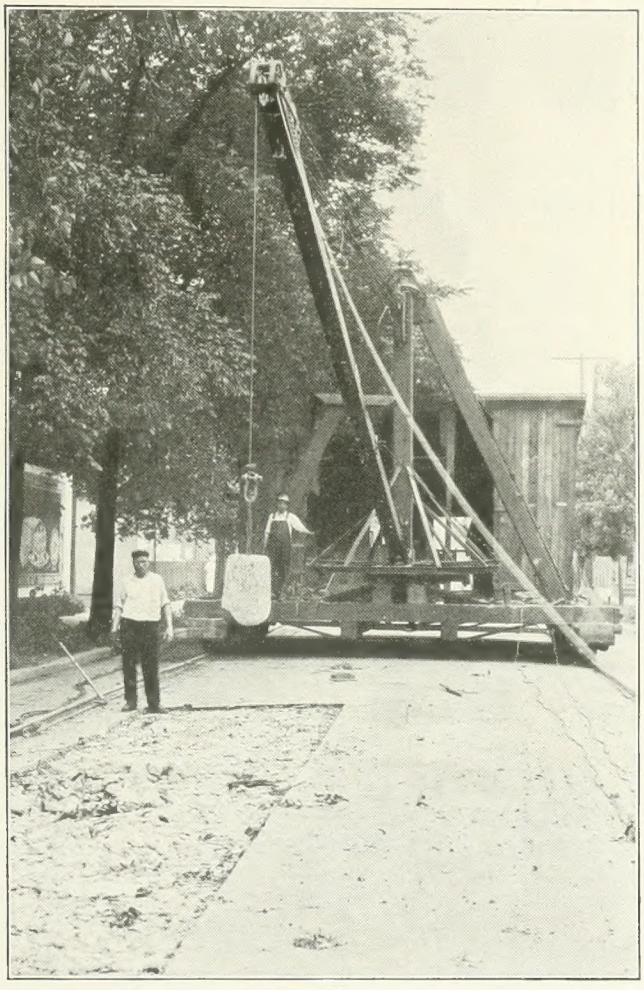

FIG. 57—BREAKING CONCRETE PAVEMENT, HAMILTON

The 6-inch concrete pavement base on Wood Street was broken by dropping a 1-ton hammer on it, worked by the excavating derrick, thus averting the laborious process of breaking it with a sledge. At Buckeye Street the concrete base, owing to its inferior quality, was readily removed by the clam-shell bucket. Taken June 2, 1919.

This sewer is made of reinforced concrete, horseshoe shaped, inside dimensions 5′-0″ x 5′-8″, and is 1868 feet long. Figure 60 shows its cross-section and design of forms in detail. It connects with the tail-race 300 feet east of Fourth Street and runs westerly, 9 feet north of the south curb, to the river. The elevation of the flowline at the connection with the tail-race is 577.0 feet. There is a change in grade at Third Street, 740 feet from the tail-race. Above this point the grade is 0.45 percent, and below it 0.40 percent. The sewer has an inside sectional area of 24.5 square feet, and is capable of discharging about 200 cubic feet per second. There is a gate manhole about 70 feet back from the outlet, in which a flood-gate will be operated during extreme flood stages. A standard manhole was provided at each street intersection, through which there can be no overflow, even with the flood-gate out of commission, as the street surface is from 6 inches to 6 feet above the maximum flood level. The gate will protect the ground surface from flooding should the river level approach the top of levee, which, at Buckeye Street, is 4 feet above the estimated maximum flood level.

Excavation. The excavation was begun at the lower end of the trench, the plant used consisting of an electrically operated traveling derrick, fitted with a ¾-yard clamshell bucket, and mounted on a 28-foot gage track, straddling the ditch; one 24-inch gage Plymouth gasoline locomotive, four 1½-yard rocker dump cars, and 420 feet of track laid with 30-pound rail. The track was placed alongside the ditch at a convenient distance for the derrick to load the cars. The amount of material by which the excavation exceeded the backfill was wasted on the river bank south of the outlet to be later removed by the large river excavating machine. The depth of cut ranged from 14 to 24 feet.

A stratum of hard, tough, blue clay, varying in thickness from four to seven feet, and lying from eight to ten feet below the surface, was found, extending from the outlet to a point some 450 feet up the trench. This material was difficult to remove and impeded the progress, increasing the expense considerably during the first month or so. Dynamite was used, but not very effectively. The clay proved to be too soft to blast and too hard to be handled satisfactorily by the clamshell. West of Front Street the material other than the clay consisted of cinders and loam. From Front Street to Fourth Street, three or four feet of surface loam was underlaid by clean gravel and sand, suitable for use in concrete.

Because of the nature of the soil and the depth of the trench continuous sheathing of the sides was necessary. Fig. 62 shows the method of shoring the trench.

A street railway line runs up Third Street to Black Street, under which the sewer trench was passed, thereby necessitating an interruption of the service north of Third Street. As the patronage on that part of the line is small, except during the early morning and late afternoon hours, the service was suspended during the day for the few days the derrick was working over the track. Provision was made to pass the cars up to 8:00 a. m. and after 4:00 p. m.

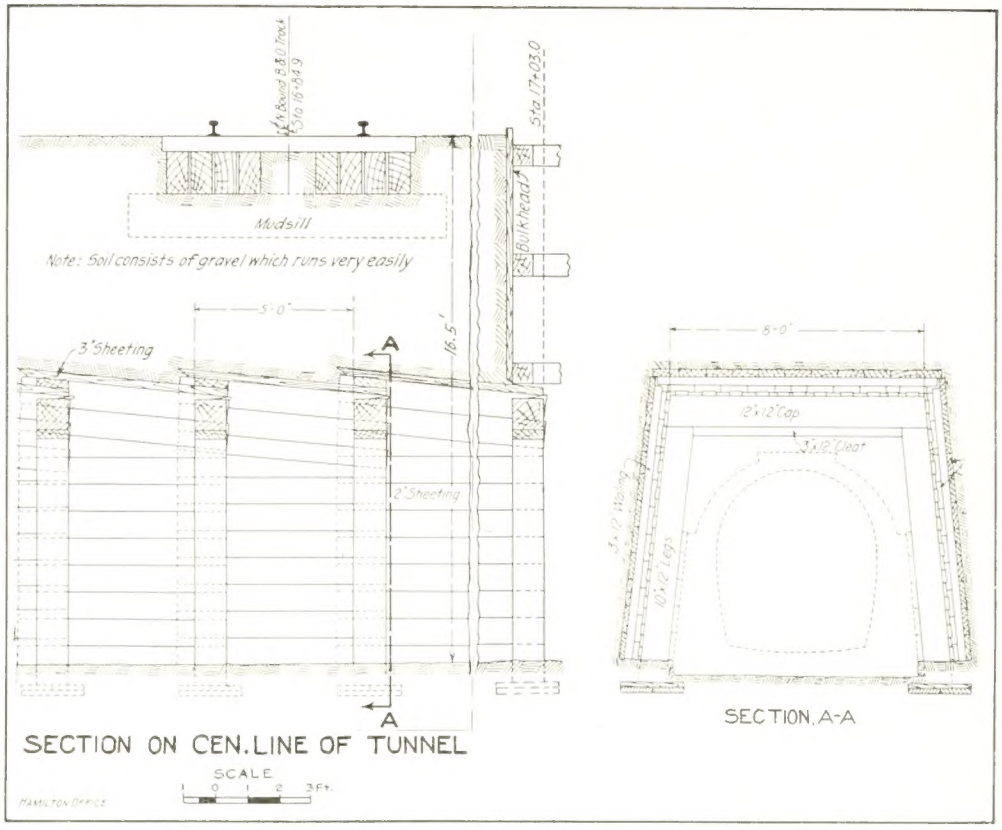

FIG. 58—TUNNELING UNDER THE B. & O. R. R., HAMILTON

The double track main line of the Baltimore & Ohio Railroad crosses Buckeye Street at Fourth Street, and the sewer was carried under these tracks by means of a tunnel. The tunnel was 48 feet long, of cap and leg construction, sheathed overhead and on the sides. The sections shown in Fig. 58 give an idea of the manner in which the tunnel was built. To guard against possible settlement of the tracks four 8″ x 16″ stringers, 30 feet long, were placed by the railroad company symmetrically under each rail, each resting on four 16-inch square mudsills, one placed on either side of the trench and one at either end of the stringers. After completing the sewer through the tunnel the remaining space was packed full of loam sand, care being taken to leave no voids. The temporary timbers under the tracks were then removed, and the original condition restored.

Concrete. A ½-yard Smith portable tilting mixer and wood chutes were used for mixing and placing the concrete. The "trench run" material supplied both the fine and coarse aggregates, as frequent screening tests made throughout the work indicated that no screening was necessary. These tests, through ¼-inch screens, showed the ratio of gravel to sand, with only one exception, to range from 2½:1 to 2:1. Sufficient cement, as determined from the tests was used to maintain a ratio of 1:2 between cement and sand, and enough water was used to make a mix that would move down the chutes with slight assistance from a hoe or shovel. Both water and aggregates were heated during freezing weather, and the fresh work was covered with tarpaulins under which salamanders were placed. However, the winter of 1918-19 was very mild, and heating was necessary in only a few instances. A layer of tar paper prevented the concrete from coming in contact with the sheeting.

Fig. 60 shows in detail the forms used, and the methods employed to hold them in place. It also shows the sequence of the concreting operations. Forms were left in place till the second day after concrete was placed, usually from 40 to 48 hours.

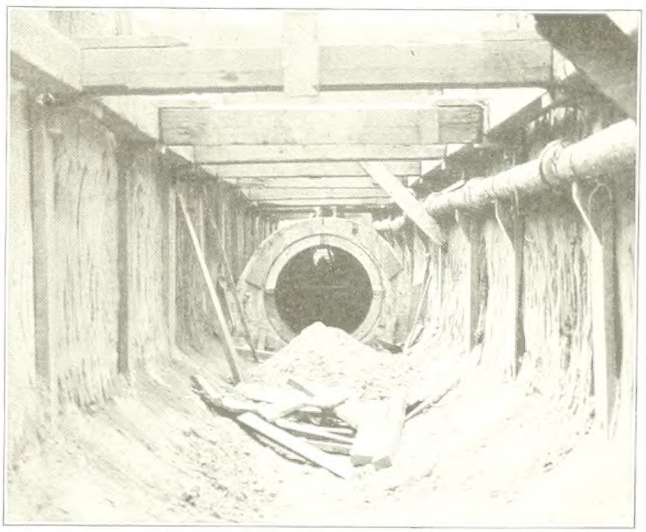

FIG. 59—WOOD ST. SEWER TRENCH, HAMILTON

View of the Wood Street trench, west of Monument Avenue. The fine loamy sand on this portion of the sewer required but little shoring. However, this condition did not prevail on most of the trench. The water main seen against the bank was successfully jacked over from the middle of the trench without interrupting the water service. It was necessary to recalk only a few of the joints. Taken June 2, 1919.

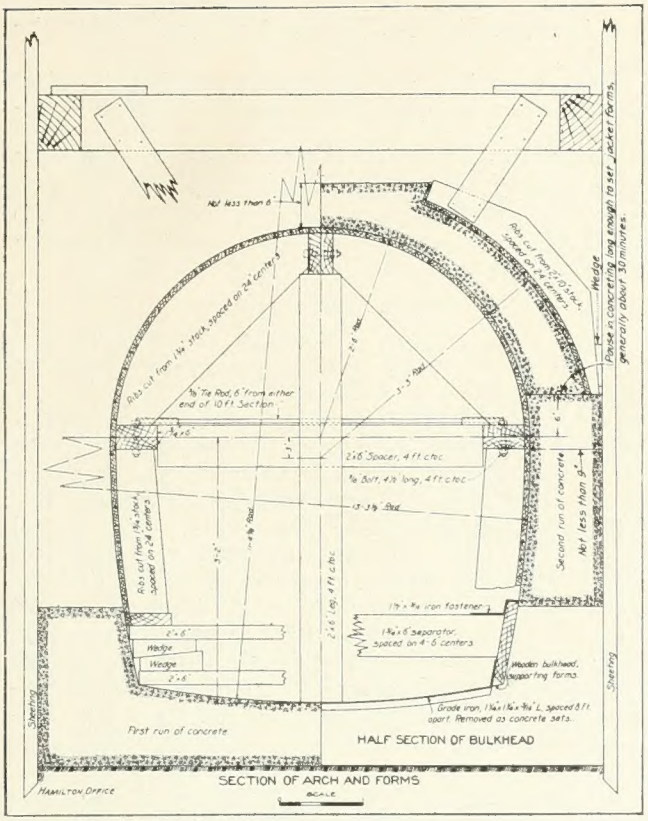

FIG. 60—SECTION BUCKEYE STREET SEWER

Backfilling. The backfilling was done by shifting the dinkey track so that the cars could be dumped into the trench. A stream of water was played upon the fill constantly and lumpy material was not allowed to remain unpuddled. The backfilling was kept close up with the concrete, and the sheeting was pulled soon after the trench was filled. A heavy timber "horse" and a block and tackle rig were used for this purpose, the power being furnished by either the gasoline locomotive or a 5-ton motor truck. Voids left by the sheeting were flushed with water. Elevations taken in sanitary sewers near the trench and parallel to it showed no settlement. However, it was necessary to remove parts of the pavement adjacent to the sheeting, because of the poor condition of both the concrete base and the wearing surface.

The street was repaved about three months after the backfilling was completed. A 10-ton road roller was used to compact the sub-grade, upon which a 6-inch base of 1:2½:6 concrete was laid. The asphalt was placed by the Andrews Asphalt Paving Company of Hamilton.

The sewer was begun in August, 1918, and completed in April, 1919. The quantities were as follows: Earth excavation 11,453 cubic yards; rock excavation, consisting of old foundations and concrete base, 303 cubic yards; concrete 1133 cubic yards; reinforcing steel 79,600 pounds.

Wood Street Sewer

In the central part of the city there is an area of about 132 acres, which until recently was served by a storm sewer on Wood Street discharging into the river north of the Columbia bridge. This sewer has a manhole at each street intersection, and as the surface of Wood Street, west of Second Street, is below the maximum flood stage to be expected (elevation 586 feet), it was necessary to place a flood-gate at its outlet. A reinforced concrete circular storm sewer, 4 feet in diameter and 1588 feet long, has been built on Wood Street, from Second Street to the river, parallel to the old sewer, to drain by gravity during extremely high river stages the 106 acres of the aforementioned area lying above elevation 586 feet. The desired condition was obtained by building a tight sewer and connecting it with the old sewer at the existing manhole at Second Street, leaving a dead end on the old sewer at which a standard manhole was built. The elevation of the flowline at the connection is 580 feet (the street surface here being elevation 590 feet) and the new sewer is built on a grade of 0.6 percent, having a capacity of a little over 100 cubic feet per second. On the river side of the levee the old sewer was connected with the new one, a gate manhole being built in the old sewer at the levee. Thus for all ordinary stages of the river the 26 acres still served by the old sewer are drained through the outlet of the new sewer. There are no manholes or other openings in the new sewer except a standard manhole at the center line of the levee, the top of which, at elevation 589, is flush with the top of the levee. West of the levee the sewer is of horseshoe shape, on a grade of 9.7 per cent. As a precaution against underwashing the outlet structure and the horse-

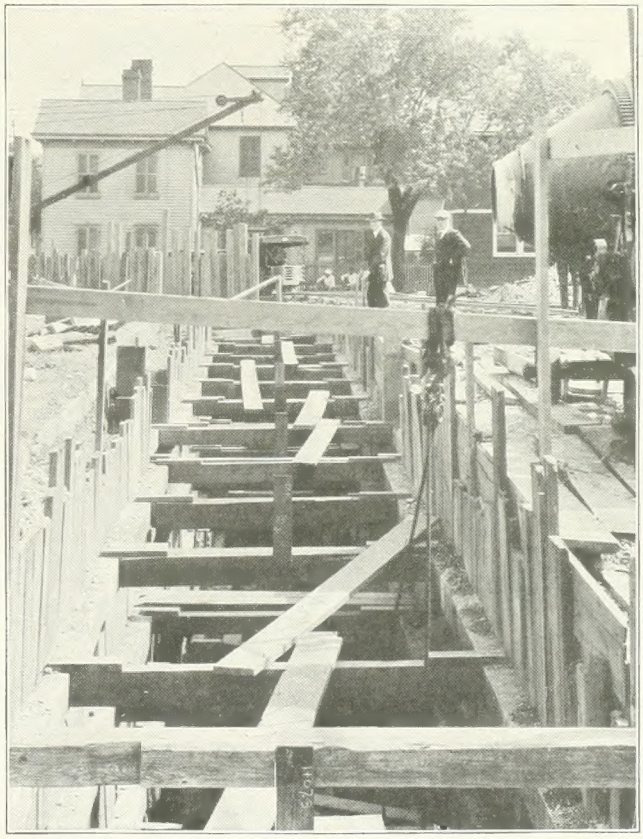

FIG. 61—TRENCH TIMBERING, HAMILTON

Buckeye Street sewer trench showing method of timbering. The depth of cut here was 23 feet, only one foot less than the maximum attained on this work. The trench is 8 ft. 10 in. wide at the top. This picture was made near the lower end of the sewer. Taken Sept. 9, 1919.

shoe portion of the sewer were built on timber piles. Fig. 63 shows the sewer from the outlet to the levee and also shows the connection at Second Street. The piles under the outlet structure range from 23 to 28 feet in length, and the balance from 15 to 20 feet.

The excavation, concreting and backfilling operations were practically the same as at Buckeye Street, the same plant being used. The depth of cut was 18 feet at the outlet, and ranged from 7 to 10½ feet on Wood Street. The deepest excavation was about 6 feet below the river level at that time, necessitating pumping, a 4-inch centrifugal pump driven by a 25 horsepower electric motor being used. Wood Street is paved with asphalt on a concrete base east of Monument Avenue, and to facilitate its removal the concrete was broken by dropping a 1-ton hammer on it by the derrick. The asphalt was cut by an improvised rolling disc, placed on a pin between the timbers, and wedged under the derrick.

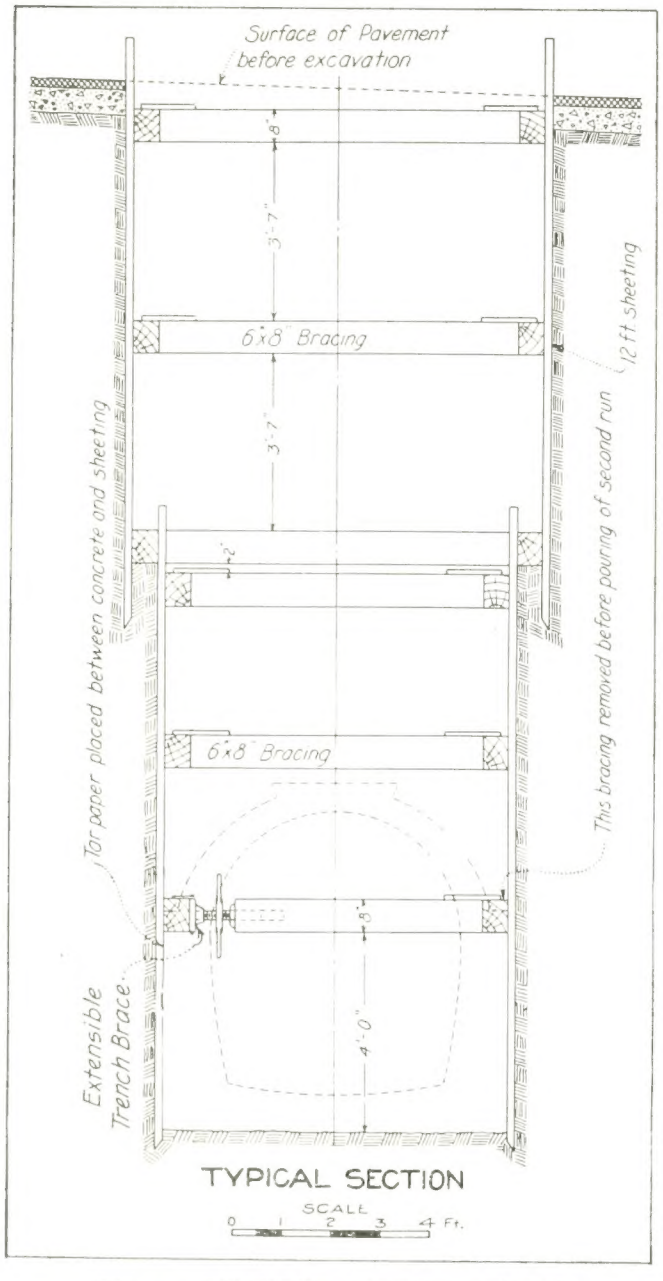

FIG. 62—BUCKEYE STREET TRENCH

The street has not, as yet, been repaved. This will be done in conformity with the original specifications.

The job was begun April 9, 1919, and completed July 31, 1919, the quantities being as follows: Earth excavation 4600 cubic yards; rock excavation 186 cubic yards; concrete 665 cubic yards; reinforcing steel 21,700 pounds; timber piles 900 lineal feet.

Front Street Sewer

There is an area lying between Wood Street and South Avenue that has been served by a storm sewer that runs southerly on Front Street to a manhole at the old Crawford's Run crossing, thence westerly in an open channel to the river. A sewer connecting the manhole with the low ground east of Front Street serves the old Crawford's Run drainage area. The outlet was closed by the recently constructed levee, and a plain concrete circular sewer, four feet in diameter and 704 feet long, has been built to drain the areas mentioned, which total about 112 acres. This sewer connects with the manhole referred to, and runs southerly along Front Street to South Avenue, thence westerly to the river. The maximum flood stage to be expected at its outlet is elevation 585 feet. The elevation of the flowline at the upper end is 567.44 feet, and the grade is 0.55 percent, the maximum capacity being about 100 cubic feet per second. This location was selected with the idea of draining still another area, farther south, in the event of a storm sewer being built on South Avenue. The cross-section of this sewer is the same as that of the Wood Street sewer. There is a gate manhole at the intersection with the levee, back of which no openings were placed.

Construction methods were the same as at the other sewers, but the trench was not completely backfilled because this portion of Front Street is within the limits of the spoil bank to be filled by the excavation from the river channel. The average cut was about twelve feet, and the material removed consisted mainly of rubbish from the city dump. This part of Front Street has never been paved. Excavation began August 13, 1919, and the sewer was completed October 18, 1919. The quantities consisted of 2750 cubic yards of earth excavation, 310 cubic yards of concrete, 1700 pounds of steel, and 680 lineal feet of timber piles.

C. H. Eiffert, Division Engineer, is in charge of the local flood protection work at Hamilton, and the writer, as Assistant Division Engineer, has had direct charge of the sewer work. F. C. Williams served as superintendent from the beginning of the work to March 1, 1919, when he resigned and was succeeded by W. A. Roush.

Hydraulic Fill at Germantown Dam (Fig. 54)

The Germantown dam is the first to reach the stage where it blocks the valley from hill to hill, effecting thus what is called "closure," and giving some measure of flood protection. The top is now about 44 feet above the old bed of Twin Creek. The stream, which formerly ran along the foot of the farther valley slope, now passes through the concrete conduits provided, issuing through the openings seen in the foreground. The bridge carries the dredge pipe line across the hydraulic fill pool.

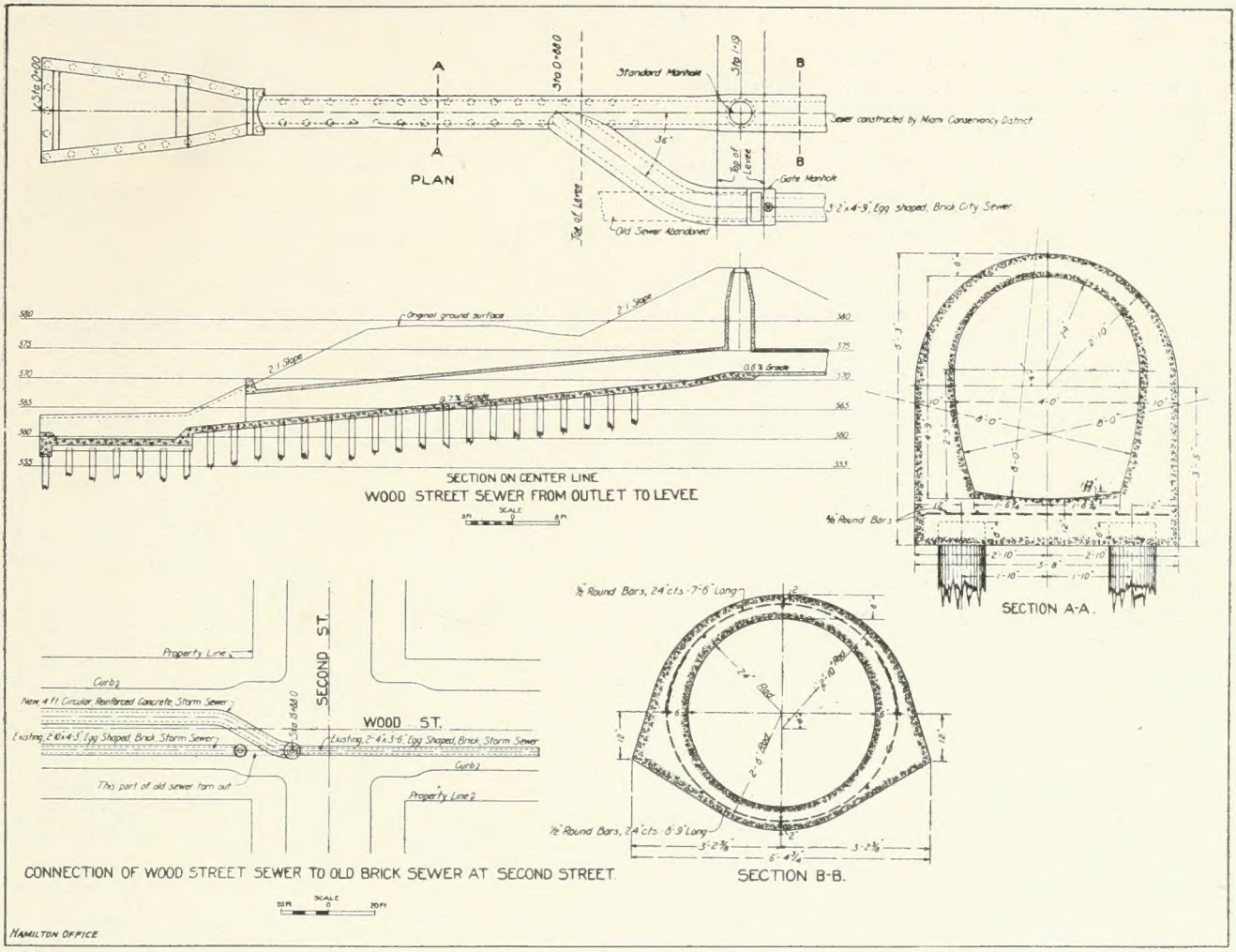

FIG. 63—PLANS AND SECTIONS, WOOD STREET SEWER, HAMILTON

November Progress on the Work

GERMANTOWN

The rate of placing the hydraulic fill was greatly increased during October over the previous months. The total amount of material placed for the month was 91,500 cubic yards, bringing the total placed in the dam at the end of October to 268,000 cubic yards. This is approximately 32 per cent of the total hydraulic embankment to be placed. The increased rate is due to the installation of larger shoes than had heretofore been used on the 36-inch runners, and to a decrease in delays from the dragline. The number of cars delivered to the pumping plant from the dragline during the month was 7,025, an increase of 1,038 cars over the previous month.

The work of protecting the upstream slope of the dam by paving it with the oversize rock from the pumping plant was started during the month. The rock is placed in a 4-yard dump-car at the pumping plant by a derrick and hauled by a Plymouth locomotive to the dam.

The Marion dragline, after being down for repairs, is again at work building the slopes of the dam. At present it is working on the upstream slope.

Work on the spillway is progressing satisfactorily. Teams are used to excavate the material when they are not in use on the dam.

Arthur L. Pauls, Division Engineer.

November 17, 1919.

ENGLEWOOD

The hydraulic fill has progressed favorably, 98,500 cubic yards being pumped during the month, carrying the general elevation of the embankment over the portion under construction up to Elevation 830, or 50 feet above the base. The fill to date aggregates 835,600 cubic yards, about 24 per cent of the entire embankment.

The cross dam east of the Stillwater River, placed by the roller method, is being pushed to completion before cold weather sets in. This portion of the embankment has been carried up about 54 feet, with but 6 feet remaining to be done.

A small cross dam has been built across a knoll on the damsite 1,700 feet east of the river. The purpose of this is to confine the hydraulicking operations to a zone within practical pumping distance of the present hog box and thereby eliminate the necessity for another booster pump.

A second sump installation, favorably located for pumping to the easterly portion of the dam, is being made.. In this manner the earth material will be deposited by the trains within easy pumping distance of its final destination.

H. S. R. McCurdy, Division Engineer.

November 15, 1919.

LOCKINGTON

On November 13 the large Lidgerwood Class K dragline finished its work on the western part of the dam where it has built to full height 3400 feet of the embankment. The material was excavated from a borrow pit extending along the north side of the dam. The dragline is now moving eastward to the railroad siding, where it will be dismantled for transfer to the work at Dayton.

Improved progress has been made during the past month on the hydraulic fill. The total amount now in place is 160,000 cubic yards. Practically all of this is west

of the outlet works where the fill has reached an elevation of 907 feet, which is 31 feet above the original creek bottom. A manganese steel dredge pump unit has been put into service to take the place of one of the cast iron units. It will be far superior to the latter in wearing quality.

The Class B Lidgerwood dragline has just completed the excavation of the cut-off trench on the higher ground at the east end of the dam. It is now digging a part of the trench west of the pike before it shifts to assist in dismantling the larger dragline.

Fences are now being built along Roads 9 and 10.

The slopes of the dam are being finished and covered with rock.

Barton M. Jones, Division Engineer.

November 18, 1919.

TAYLORSVILLE

The progress of the Lidgerwood dragline on the outlet works excavation last month was slightly below the average for the three months previous, but still above the schedule set for this work. It is now working up the incline from the deep pool to the lower end of the conduits.

The sluicing was shut down on November 1st, until such time as the B. & O. R. R. can be moved to the new location and the present roadway vacated.

Concreting was started at the lower end of the outlet works on October 17th, but since almost the entire output of our gravel pit the last few days was taken for ballast on the new B. & O. only about a thousand yards of concrete has been placed to date. Recently a Model 70 Marion steam shovel has been fitted up with a 70-foot dragline boom and this machine is now digging gravel for the concrete plant.

About 75 per cent of the gravel ballast for the B. & O. relocation has been delivered.

The approaches to the concrete bridge over the B. & O. relocation have been graveled by contract by Charles Crampton, and as a part of this contract a farm road has been graded and graveled from Road No. 12 at the bridge to the old road near the present B. & O. tracks just north of the dam.

O. N. Floyd, Division Engineer.

November 18, 1919.

HUFFMAN

The placing of material in the dam embankment by hydraulic fill has been proceeding continuously during the past month. 60,830 cubic yards of material were pumped into the dam during September. The first lift has been completed on the downstream side and the first two lifts on the upstream side. The small dragline is building the outside levees up to the lower berm.

The distributing equipment used to place the concrete in the outlet works has been dismantled, and other cleaning up work is practically complete.

The culverts on the relocated line of the Valley Pike have been completed and the grading is nearing completion.

C. C. Chambers, Division Engineer.

November 19, 1919.

DAYTON

Channel excavation to date amounts to 635,000 cubic yards. A total of 450,500 cubic yards has been placed in levees and spoil banks, including 60,000 cubic yards of levee embankment on Contract No. 41. In accomplishing this work a total of 1,110,700 cubic yards has been handled.

The two large draglines have continued channel excavation and spoil bank fill, D-16 excavating below Dayton View bridge and D-15 placing the material in the spoil bank below Herman Avenue. The proposed cut along the right bank between Dayton View bridge and Salem Avenue is now being made. D-16 has also placed a stock pile within reach of the gravel plant derrick.

The D-19, Class 9½ caterpillar dragline has placed all of the required levee and spoil bank fill on the right bank above Herman Avenue and is now removing the 12-inch cast iron water pipe which was left in the bed of the river above Herman Avenue when the main was replaced last season.

Placing concrete revetment is progressing on the left bank of the river below Island Park dam. Work was delayed for several days because of the high water.

The concrete wall at the Dayton Canoe Club house has been completed.

Forms are in place for a part of the Bank Street crest wall on the right bank between Third and Fifth Streets.

Concrete is now being placed in the South Robert Boulevard retaining wall.

A second derrick has been installed at the gravel washing plant. It will be used for storing aggregate as the output of the plant exceeds the demand.

Price Brothers have completed manufacture of the 182,000 concrete blocks required in Dayton for flexible revetment. The last blocks were cast November 8.

C. A. Bock, Division Engineer.

November 17, 1919.

HAMILTON

The total yardage handled by the two draglines to November 1, 1919, was 937,600 cubic yards. The total pay dirt, including McGillicuddy's contract, was 484,300 cubic yards. This excludes all dirt moved twice, and dirt moved in auxiliary work like the deep water channel.

The electric dragline D-16-18 has completed the last cut on the east side of the river south of the Columbia Bridge and is at present excavating for a new submerged outlet for the east side sanitary sewer system.

The steam dragline has been excavating the Ford tailrace west of the B. & O. R. R. It has also handled the pile driver for the piling driven as a temporary support for the 24-inch water main crossing Old River. This water main will be lowered below the bed of the new channel after the excavation is completed.

The work of driving the steel sheet piling under the B. & O. bridge over Old River has been completed. The excavation under the south arch has been completed and concreting begun. Excavation under the north arch is nearing completion. The excavation is for the foundations of the concrete tail-race of the Ford Tractor plant, which will divide, a branch passing under each arch.

An 8-inch centrifugal motor-driven pump has been installed west of Third Street to unwater the tail-race excavation.

On the concrete wall work south of the Soldiers' Monument the sheet piling has been driven to grade and the excavation practically completed.

The portable gravel screening plant has arrived and the derrick to be used in handling the gravel has been moved to its new location.

C. H. Eiffert, Division Engineer.

November 20, 1919.

TROY

The business district of the city of Troy is situated on high ground on the right bank of the Miami River. A strip of low land lies between this part of town and the hills to the west which form the highland along the valley. During the 1913 flood, a large part of the discharge of the river passed through this low section. While comparatively little harm was done along the river channel proper, great damage resulted from the flooding in this lower lying land on the opposite side of the city.

The principal features of the Troy improvement are: (1) a levee at the upper end of the city, across this strip of low land, to cut off the flood water from this section of the city, (2) the enlargement of the main channel through the center of town, to take care of the increased flow which will be forced through this channel because of the levee above, (3) the creation of a valuable residence district near the center of the city, by filling in river bottom land with the spoil from the channel excavation, (4) a cut-off channel across a U-shaped bend in the river, and (5) a levee parallel to this channel, to protect the lower end of town.

Work was started by the contractor for the Troy improvement, Frank McGillicuddy & Co., on November 3. The cut-off channel and levee paralleling it will be built first. The earth is excavated from the channel and placed in the levee by a Bucyrus Class 14 caterpillar dragline, with a 65-foot boom. It is expected to complete this part of the improvement by spring. The cut-off channel will lower the level of the water in the river above, and thus facilitate the enlargement of the present channel. The

bottom width of the cut-off is 40 feet, but it is expected that the river will enlarge this until it becomes the main channel, and the present one around the bend will gradually silt up.

E. W. Lane, Assistant Engineer.

November 19, 1919.

LOWER RIVER WORK

Middletown—Cole Brothers have completed the levee fill to a point about 500 feet below Sixth Street and have built a road over the levee at the end of Sixth Street. They were delayed two or three days by high water, which rose a total of seven feet on November 1. The fill for the north levee is practically completed from the point of beginning above Poasttown Road to within a short distance of Adams Street.

Franklin—Jeffrey, Boorhem & Co. are working on the second throw of material from the river bed in front of the water works plant and the Pulp and Paper Co.'s plant. They will soon commence moving this material the third time, which will place it in its final location in the levee and Oxford Road. The road at this point will be raised to extend over the levee. The high water which occurred during the week ending November 1 caused a delay of several days to this work and made it necessary to move the dragline machine onto higher ground.

Miamisburg—Jeffrey, Boorhem & Co. have placed approximately 12,000 cubic yards of material in the levee adjacent to the B. & O. R. R. above Germantown Pike, working with their train outfit. They will soon be ready to extend their tracks south of the Germantown Pike. A delay of about a week was caused by rain and high water during the latter part of October and first of November.

F. G. Blackwell, Division Engineer.

November 17, 1919.

RAILROAD RELOCATION

Baltimore & Ohio—Roberts Brothers have completed the first lift of the ballasting and about half of the second lift, the track having already been entirely completed. The ballasting has been much delayed by bad weather and scarcity of labor.

The raising of the track south of Needmore Road, which is being done by the B. & O. forces, is about completed.

H. C. Kahl, with Miller Brothers as sub-contractors, is making good progress on the building of the right-of-way fence.

Big Four and Erie—The grading on these two railways is now completed with the exception of widening the embankment near Enon.

Track laying is under way, about 15 miles of it having been completed. About 80 per cent of the ties have been received, and all of the other track material.

The overhead bridge at Huffman, to carry the highway across the railway tracks to the top of the dam, is rapidly nearing completion. The structure is of concrete.

Work has been started on the interlocking tower at Tate's Point by the forces of the District. The tower will be built of brick and concrete. A portion of the signal equipment has been delivered.

The Big Four Railway signal gang has started work on the interlocking system at Fairfield.

All the signal equipment has arrived.

The fence gang has completed about 15 miles of right-of-way fence.

Ohio Electric—The grading is completed and tracklaying will begin as soon as the machine has finished that work on the Big Four & Erie.

Albert Larsen, Division Engineer.

November 21, 1919.

RIVER AND WEATHER CONDITIONS

The streams throughout the Miami Valley were comparatively low during the first three weeks of the month of October. Rainfall averaging about 3 inches over the valley during the last week of the month caused a slow rise in the rivers of from 3 to 7 feet. No damage resulted from this to the Conservancy work or to the equipment.

The rainfall was considerably above normal for October, varying from 4.09 to 7.53 inches at the District's stations. At the Dayton Weather Bureau Station the total precipitation during the month was 7.08 inches or 4.68 inches more than normal, which changes the accumulated deficiency in the mean annual rainfall to an excess of 1.92 inches since January 1.

Observations taken by the local office of the U. S. Weather Bureau show that at Dayton, the mean temperature for the month was 60.8° F., or 6.7° higher than normal; there were 7 clear days, 7 partly cloudy, 17 cloudy days, and 16 days on which the precipitation exceeded .01 of an inch; the average wind velocity was 9.3 miles per hour, the prevailing direction being from the southwest; and the maximum wind velocity was 37 miles per hour from the northwest on the 10th.

Ivan E. Houk, District Forecaster.

November 24, 1919.

Railway Grading With Stiffleg Derrick Draglines

65,000 Cubic Yards Moved for 26.7 Cents Per Yard.

The use of excavators with interchangeable steam shovel and dragline equipment is common. The transformation of an ordinary stiff-leg derrick into a dragline for use in railway grading has elements of novelty, and its application in the work of the Miami Conservancy District may be of interest and value.

The application was to the grading of the Ohio Electric Railway across the flats of the Mad River valley north of Osborn, a distance of about a mile and a half. The top soil is loam, one to three feet deep, with gravel below. Water occurs three to four feet below the surface. The fill varied from five to nineteen feet. The use of a plow with wheel scrapers or of an elevating grader with dump wagons would have required a right-of-way three to four hundred feet wide, on account of the shallow cut necessary. The use of a dragline, permitting underwater excavation, reduced this width to two hundred feet. The total excavation was 65,000 cubic yards. It is in such jobs of comparatively small size, making investment in large equipment unprofitable, that the adaptation has its value.

The District had two stiff-leg derricks available which had been in use at Ohborn, both as derricks and as clam shells with 1-yard buckets. It was proposed to take these two derricks, equip them with 1½-yard dragline buckets, and work them as a team side by side, one to a borrow pit, on each side of the embankment to be built. (See Fig. 65.)

The two derricks were much alike and the description of No. 1 will be sufficient for both. The machine was mounted on a 30′x30′ base of 12″x12″ timbers, moving on 8″ rollers. The mast was of white oak 14″x16″ by 24′. The boom was of yellow pine, 12″x14″x62′, equipped with hog rods. The bull wheel was 12′ in diameter. The hoist engines were double, 9″x10″, equipped with 3 drums 16″x 30″. Ropes as follows: ⅝″ boom-fall, ⅝″ load cable, ½″ hoist cable. Swing engines were double, 4½″x5″, with drum 26″x12″. The boiler was 48″x8′6″, vertical, carrying 100 lbs. pressure. This machine was bought by the District in fair second-hand condition for $4300. No. 2 was slightly smaller and cost $4000.

Either of these machines could have been transformed into a dragline by substituting a dragline

FIG. 64—DERRICK DRAGLINES LOADING CONCRETE GRAVEL, MAY 5, 1919

A stiffleg derrick converted into a dragline excavator. It is excavating gravel from the Ohio Electric R. R. borrow pit into the hopper, whence it drops into dump wagons, to be taken to the mixer at Smith Ditch concrete trestle. The steel boom was made from one of the stifflegs taken from a converted derrick on the Conservancy work at Lockington. Taken May 5, 1919.

bucket on the drag, still running the load cable from the breast sheave to the bucket through a mortise cut in the boom, the latter being strengthened on each side opposite the mortise by a 4″x12″ oak timber 10 or 12 feet long, bolted through. The District, however, had on hand the stiff-legs from a steel derrick which had been re-equipped, and it was thought better to rebuild these stiff-legs into booms for the dragline derricks, with the hope that it would enable the use of a larger bucket, say 1½ yard size, thus expediting the work. This was accordingly done. These booms were 20″x20″ at the center section, 62 feet long, built of four angle irons 3″x3″x ⅜″, with lattices 5-16″x2½″ spaced 30 inches, and with end plates at the top 4′x6′x½″, carrying 2-16″ sheaves above and 3 of the same size below. These booms proved entirely satisfactory, although for reasons to be stated, the buckets had to be reduced from 1½ to 1 cubic yard in size.

The two derricks, thus equipped, are shown at work in Fig. 65. One of them, temporarily in use to load gravel for concrete bridge work, is shown in Fig. 64. The derricks ran on timber ways built up about 18″ from the ground. This arrangement fitted well with the work of clearing out stumps, several acres of which had to be handled. The trees were sawed off close enough to the ground to permit the draglines to run over them, thus bringing them into the borrow pit, whence they were pulled by the dragline buckets acting as "tooth extractors."

It was the extracting of these stumps which threw the greatest strain on the transformed mechanism and led to the chief troubles in the way of breakages. All the cables had to be made larger, the final sizes adopted being ¾″ for drag and swing cables and ⅝″ for boom fall and hoist cables. Experience indicates that for drag cable 1″ should be used on these machines. The necessity of adopting ample sizes for cables is emphasized by the fact that the total cable bill on the 65,000-yard job was $1405.13.

Other chief difficulties encountered were due to wear of the sheaves, and breakage of the goose necks connecting the stiff-legs to the top of the mast. Te heavy strain of dragline work also led to rather excessive wear on the pins of the breast sheaves and bottom sheaves. The breast sheaves were 14″ diameter with 2″ pins. 16″ diameter with 3″ pins are recommended. The bottom sheaves were 16″ with 2½″ pins. 24″ diameter with 3″ pins are recommended. Here again the bill for sheaves on the job—$628.15—tells the story of the necessity of attention to these details. The goose necks were 2″x10″ plates bolted to the under sides of the stiff-leg timbers. They were reinforced by 1″x10″ plates bolted through on the top side of the timber, the bolts being 1¼″x18″ and six in number. With this change no trouble has been since experienced.

The greatest single delays were due to stoppages necessary to reflue the boilers on both derricks, and to repair a badly worn drum pinion. These delays, due to other causes than those characteristic of the dragline job, are not strictly chargeable to this work.

As to costs. The force of men required by the draglines proper required 1 foreman, 2 dragline runners, 2 firemen, 1 pumpman, and 8 laborers—14 in all. In addition, 2 to 3 men were kept on the embankment dressing the crown and slopes. The working day was 10 hours, of which a two-hour loss, due to stoppages for repairs, oiling, moving ahead, etc., was considered normal. The job took about four months. The figures follow:

Original cost of derricks: No. 1 $4300 —No. 2 $4000. Operating expenses as follows:

Shop Repairs	$ 2407.53
Labor	13331.14
Materials (cable, coal, etc.)	3062.80
Field Acctg.	220.96
Hauling draglines Osborn to Dayton	216.96
Dayton Garage	8.42
Total	$19247.01

The total material moved was 65,000 cubic yards, giving an operating cost per cubic yard of 29.6 cents. Deducting time lost for retubing boilers and cost of repair of same, these items not being fairly chargeable to the job, reduces the cost to 26.7 cents. This represents a contractor's cost, with materials, repairs and labor obtained in the open market, and no

overhead except for field accounting. As an interesting comparison, it may be noted that the contract's bid for the job before the District undertook it by force account, was 35 cents.

As has been noted, it was a great advantage for the use of these draglines here that much of the material could be taken from under water, thus lowering right-of-way cost. An additional advantage of this was that all of the material was put in the bank soaking wet, making an unusually solid structure. The banks were staked for 5% shrinkage only, on this account. The finished structure shows not more than 2½ to 3 per cent.

Summing up, it may be said that after paying the entire cost of making the changes required, the Conservancy District has two machines in first-class rebuilt condition, equipped to be used either as derricks, clam shells, or draglines, at a total cost of $8300, having at the same time built 65,000 cubic yards of embankment at a price per yard 5.4 cents below the contractor's bid. The figures may be left to speak for themselves.

The idea of the transformation came from Wm. McIntosh, Master Mechanic for the District, but the successful carrying out of the scheme was due in no small degree also to the efficient co-operation of Leslie Wiley, Superintendent, and John Rosite, Foreman on the work.

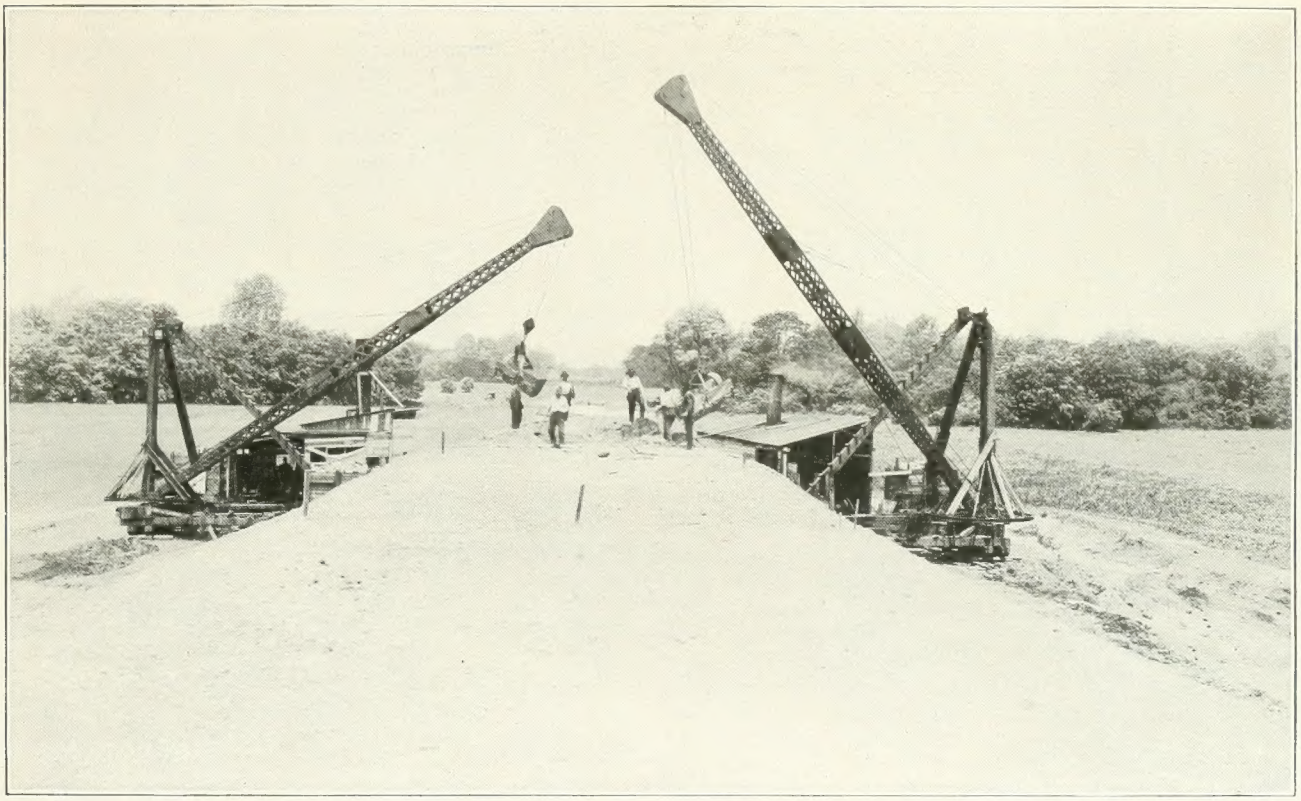

FIG. 65—TEAM OF DERRICK DRAGLINES BUILDING OHIO ELECTRIC RAILWAY EMBANKMENT

The embankment, 1½ miles long, extending across the flats of the Mad River Valley, and totalling 65,000 cubic yards, was built by these machines at a cost of 26.7 cents per yard, including cost of converting the booms and making the experimental transformations. The derricks "crawfished" down the pike on wood rollers running on a timber crib built high enough to permit running over the stumps (sawed low), which were then snagged out of the pit by the drag bucket. The depreciation in these rigs was negative, as they finished the job in much better shape than when they began. Cables, sheaves and goose necks proved to be the weak spots in the original mechanism, as applied to such work as this. Mad River (beyond the trees in the distance) was crossed on the timber falsework for the new concrete bridge. The crossing took two days. Most of the material for the railway embankment was taken from under water, making an exceptionally solid bank. Shrinkage about 2½ per cent.

Flood Protection Work at Middletown

The flood of 1913 brought to Middletown a volume of water equivalent to a flood about three-fifths of a mile wide and ten feet deep. The river channel could carry only a little over three-eighths of it. There were no levees and the water consequently spread over the city unchecked. Fortunately, the valley at this point is very wide, about two miles in breadth, and the depth of water in the streets was proportionately shallow—five to eight feet deep, so that comparatively little damage was done as compared with some of the other cities. About half the area of the city was flooded. (Flooded area—750 acres). The normal slope of the river here is about 3.3 feet per mile and the entire drop of the water surface through the city proper is about 10 feet.

Almost all of the city lies on the east slope of the valley, and this fact, together with the wide valley and the shallow flood depth makes the problem of flood control a comparatively simple one. A single earth levee, following roughly the foot of the eastern valley slope, is the principal feature. With the wide

FIG. 66—MAP SHOWING RIVER IMPROVEMENT, MIDDLETOWN

flood flow no concrete lining of the river slope of this levee is considered necessary. Wash will be prevented by dressing the levee with top soil and sowing the surface to grass seed.

The only complicating factor is due to the two canals which, drawing their water from the river about two miles above the city, flow through it. (See Map, Fig. 66). One of these is the old Miami & Erie traffic canal, now no longer used except for water supply. The other, the hydraulic canal, is used for power purposes by several industries.

The levee is in two portions. One, beginning at the northeast limit of the city, just east of the Poasttown road, follows the canals to First Street. The other follows the river, beginning at Fourth Street. Between First and Fourth Streets the river bank is as sufficient elevation to make a levee unnecessary. The upper portion of the north section of the levee forms the south bank of the Miami and Erie Canal to the head of Hydraulic Street, where it crosses this canal to form the south bank of the hydraulic canal, which here borders the north edge of Hydraulic

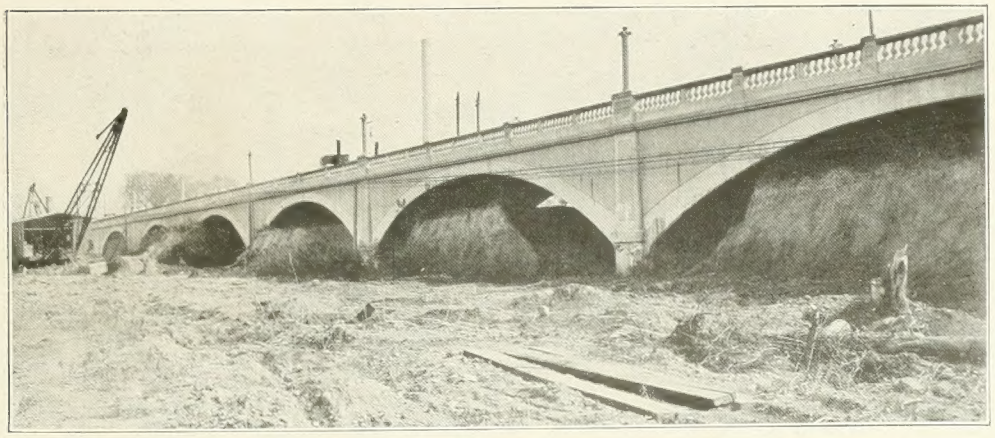

FIG. 67—EXCAVATION AT THIRD STREET BRIDGE, MIDDLETOWN, SEPTEMBER 10, 1919.

The original ground surface is indicated by the unexcavated earth under the arches. The work was done by the dragline excavator seen in the distance, the valley bottom being cut down as shown in order to obtain increased flood flow. The earth under the arches being inconvenient to get at, was left for the river itself to excavate. See last paragraph of article.

Street to the end of the north levee. At the levee crossing the Miami and Erie Canal enters the city proper, and gates will be installed here to be shut during flood seasons.

Hydraulic Street, between which and the hydraulic canal the new levee forms the boundary, is narrow in width. It is being improved by widening it to 55 feet. The consequent encroachment upon the canal is being recompensed by cutting away the north bank, maintaining thus a water way in the canal of at least 42 feet. The levee here, less than two feet high, is of concrete, enabling it to be placed entirely outside the street limit.

The only portion of the work to offer difficulty has been the widening of Hydraulic Street, just referred to. The natural way to do this was to dig material from the north bank and deposit it next to the south bank, thus preserving the canal width and widening the street at one operation. This method was adopted, the excavation being done by a small (1½-yard) dragline excavator. The difficulty lay in the swift current in the canal water, which was sufficient to carry away surface soil dug from the north bank as fast as it was deposited. Fortunately, the substratum here is gravel, which being much heavier, would on deposition remain in place. Unfortunately, however, after several hundred feet of street length had been thus widened, the gravel sub-soil ran out, and the lighter loam and clay running away on the current as fast as it was dropped by the dragline bucket, the street widening by this method was brought to an end. The remainder of the canal excavation was used to form the north bank. The unfinished fill for street width will probably be brought by dump wagone from a nearby gravel pit to be opened north of the canal.

The first part of the work at Middletown to be finished was the south end of the south levee. This will shut off the flood water which heretofore has come across the Cincinnati Pike from the river in times of high water. The embankment was thrown up by a railway steam shovel which had been converted into a dragline excavator. This machine did some very effective work. The largest day's excavation amounted to 1200 cubic yards, advancing the levee 120 lineal feet.

Probably the most striking part of the work has been the excavation of a new channel cutting off the big bend in the river which passes under the Third Street bridge. This cut-off shifts the channel a maximum of about 1000 feet to the west. (See Map, Fig. 66). It is about 3600 feet long, about 10 feet in average depth, 40 feet in excavated bottom width, and carries at ordinary stages about 5 feet depth of water. The sides of this channel, being mostly river bottom loam, are being eaten away rapidly with every rise of the water in the river. This was foreseen and was the reason for the narrow width of the channel as dug. It was expected that the dragline would simply pilot the excavation, leaving the river to follow and dig the main part of the cut-off for itself. The widening is expected to continue till the new channel will take most of an ordinary flood and all of the ordinary flow, thus stopping most of the erosion now taking place next the city on the east bank of the present bend. This erosion has been in the past not inconsiderable. Skeletons out of an old graveyard are said to have been tumbled into the river by floods many years ago. The remains of this old graveyard have entirely disappeared.

Influenza and Conservancy Medical Service (continued.)

tains. Keep the south curtains up. Sunlight is one of the best "microbe killers" known and a faded rug is cheaper than say a faded baby.

In this connection it may be well to call attention to the unusually good health record of the Conservancy camps during the past year. This has been largely due to two things. The first of these is the very exceptional care taken in the beginning to make the camps sanitary. Each camp has a sewage purification plant. Each is also supplied with pure water from a driven well, pumped to every house in the camp.

The second reason referred to has been the careful and regular inspection of sanitary conditions at the camps. The water supply at all the camps is examined three times during the year by the chemists of the Ohio Department of Public Health at Columbus, samples being regularly forwarded for the purpose. The samples have in all cases shown a good test. The sewerage system has also been approved by the State Inspector and is periodically re-examined once in two months. The inspections have shown the system to be working well. There have been no complaints, either of plumbing or the outside system.

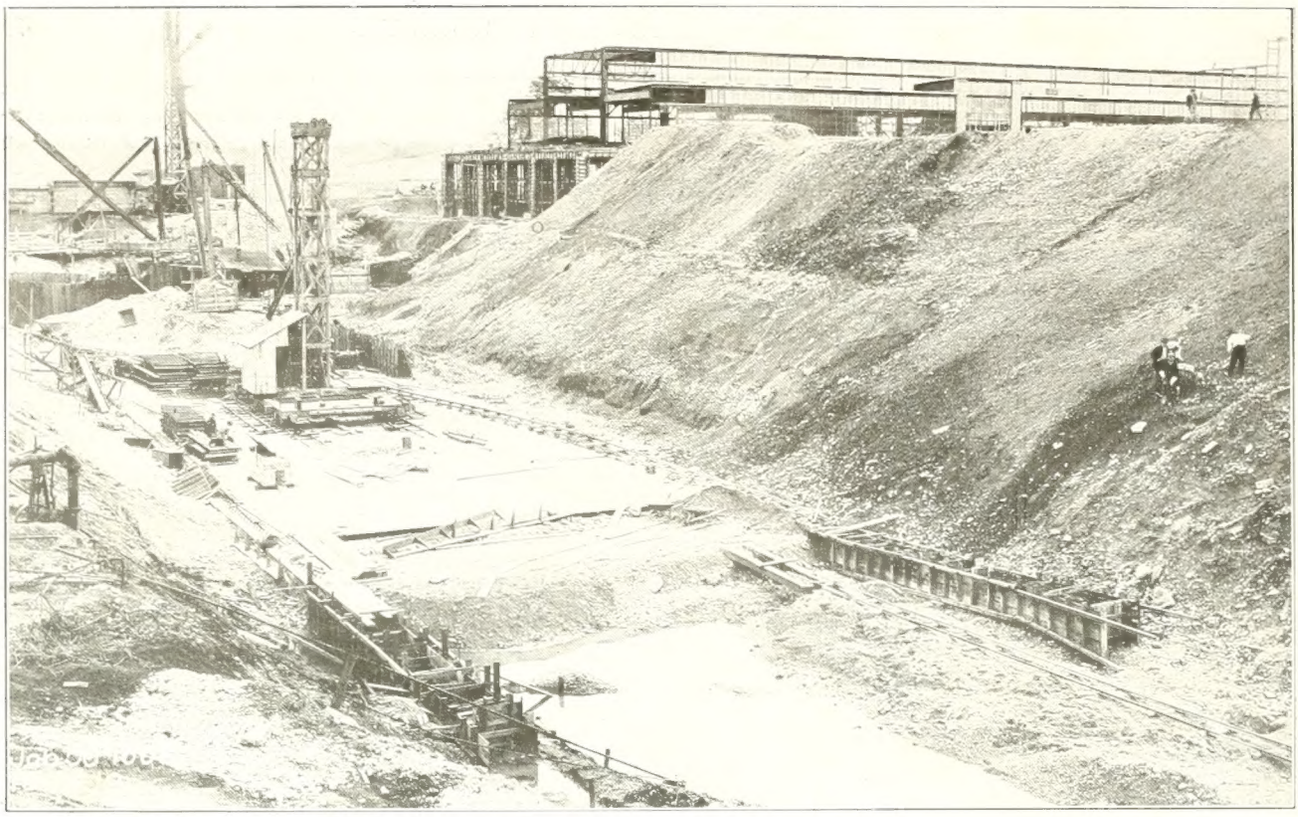

FIG. 68—AT WORK ON TAILRACE, FORDSON TRACTOR PLANT, HAMILTON.

This plant, seen in the distance at the right, occupies a "strategic point" of attack for a flood striking Hamilton, the bank at the right being the new north protection levee opposite the mouth of the Old River channel (out of the picture at the left). The building of so important a structure at such a place by a man of Henry Ford's acumen indicates a confidence in the flood protection plans worth noting.

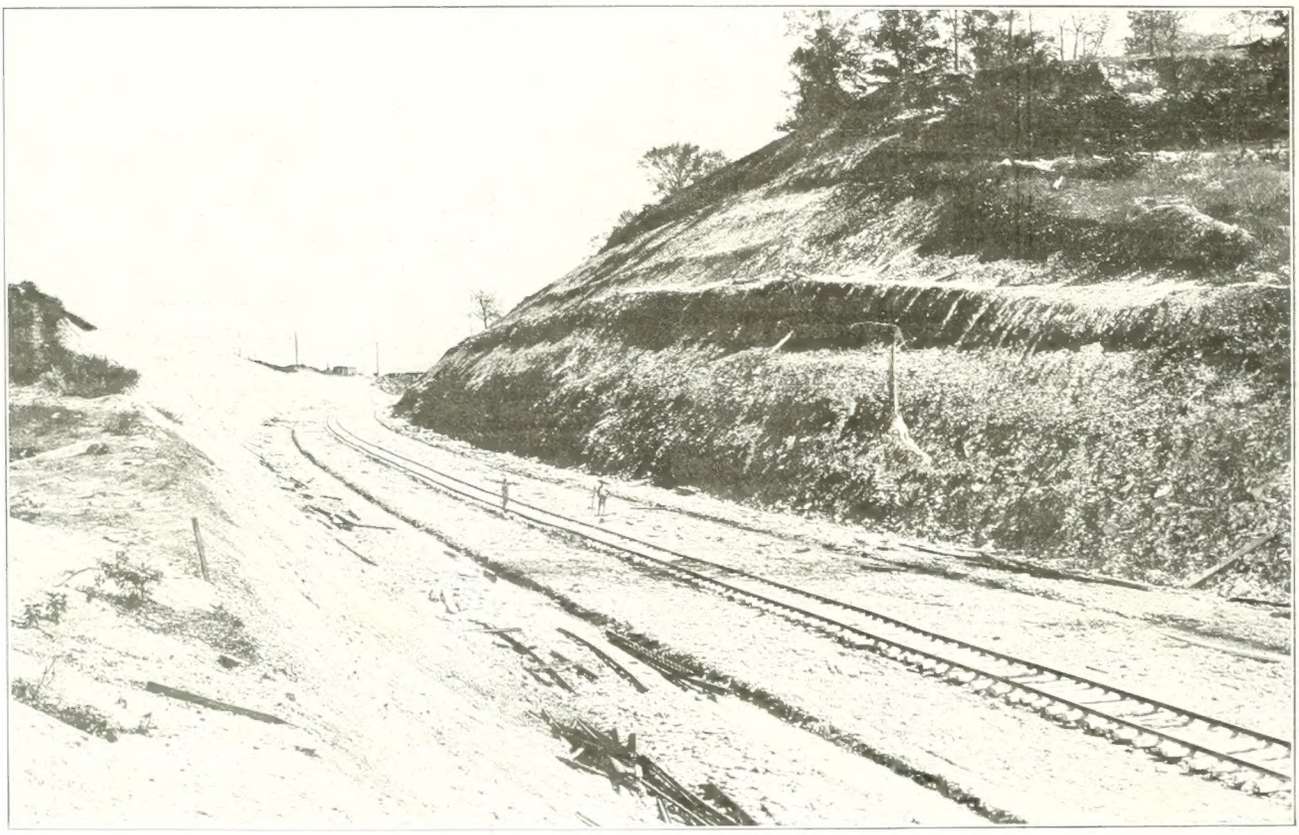

FIG. 69—HEAVIEST CUT ON BIG FOUR AND ERIE R. R. RELOCATION.

Maximum depth, 119.8 feet. Length, 4500 feet. Bottom width, 72 feet, to accommodate four tracks, only two to be laid at present. Total earth excavated, 630,000 cubic yards, of which over 500,000 cubic yards was rock.